

Remarks

Status of the Claims

Claims 1-8 and 9-13 are presently pending. Claim 7 has been cancelled, and claims 12 and 13 have been added. Claims 1, 10, and 11 have been added. Applicants aver that no new matter has been added by this amendment.

Objection to the Abstract

The Examiner has objected to the abstract because it exceeds 150 words in length. The abstract has been amended to include 150 words or less.

Claim Rejections Under 35 U.S.C. § 101

Claim 11 stands rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. In particular, the Examiner asserted that the computer readable medium of claim 11 reflects a generic term that can be directed to a signal and that the claim is therefore not statutory.

Applicants have amended independent claim 11 to more clearly reflect that the computer readable medium is a non-transitory computer readable storage medium that includes instructions which when executed by a processor, cause the processor perform the outlined operations. Thus, independent claim 11 cannot now be directed to a signal claim and is therefore statutory. See “Subject Matter Eligibility of Computer Readable Media”, signed by Under Secretary Kappos on January 26, 2010.

Claim Rejections Under 35 U.S.C. § 103

The Examiner rejected claims 1-11 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,999,840 to Grimson et al. (“Grimson”) in view of U.S. Patent Publication No. 2001/0016684 to Shahidi (“Shahidi”). The rejections are respectfully traversed.

The present application relates to a surgical operation supporting apparatus that utilizes surface configuration data obtained by optically measuring the surface of a brain using the three-dimensional shape measurement device during surgery, carrying out image pickup of the surface of the brain using the video camera during surgery, and measuring unexposed area data, where the unexposed area includes portions below the surface of the operation site,

with ultrasonic waves by means of the ultrasonic tomographic imaging device. In addition, an MRI image is collected and corrected, with the corrected MRI image representing the current state of the brain with a high degree of precision that is displayed during the surgical operation. Therefore, it is possible for the surgeon to observe the current state of the brain including the displacement or distortion that occurs during the surgical operation.

Grimson relates to a system for registration of three-dimensional data sets including a first data set of 3D tomographic images obtained before the operation, a second data set of 3D surface configuration data of the surgery environment, and a third data set of 3D images of the surgical instrument. The system of Grimson registers the above data sets on the same three-dimensional coordinates and superimposes the images upon on another.

Shahidi relates to a surgical navigation system has a computer with a memory and display connected to a surgical instrument or pointer and position tracking system, so that the location and orientation of the pointer are tracked in real time and conveyed to the computer. The images are segmented and displayed in color to highlight selected anatomical features and to allow the viewer to see beyond obscuring surfaces and structures. The displayed image tracks the movement of the instrument during surgical procedures.

With respect to claim 1, the Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of the invention to expand Grimson to model and register images acquired with the brain with pre-acquired three dimension tomographic images and to place the scanning unit for the first acquisition in a surgical probe based on a proposed combination with Shahidi. One of ordinary skill in the art at the time of the invention would have been motivated to expand Grimson to further enhance surgical procedures inside the brain by providing real time updates of the brain structures and to provide a surgical imaging method and system which generates real-time, adaptive, enhanced visualizations of the patient in the operating room

Applicants respectfully submit that Grimson and Shahidi fail to teach, suggest, or render obvious “estimating displacement and distortion at a portion whose three-dimensional position is not known in the three-dimensional model generated based on a plurality of high-definition tomographic images of the operation site to obtain an estimated result, which images are taken before surgery, re-correcting the three-dimensional model of the operation site by use of a finite element method and the estimated result, and correcting the plurality of

high-definition tomographic images based on the re-corrected three-dimensional model of the operation site” as recited in claim 1.

Grimson and Shahidi, alone or in combination, fail to teach a finite element method that corrects the positions (the three-dimensional coordinates) of node points other than the node points targeted for correction of the positions thereof as claimed. The methods disclosed in Grimsom and Shahidi are based on the assumption that the displacement or distortion of each of the parts it not be evaluated. Namely, the disclosed methods of Grimsom and Shahidi are based on the assumption that the surface of the operation site and the unexposed portion of the operation site are displaced and deform together with each other.

However, the actual operation site does not behave according to the assumption. The claimed method uses the finite element method and feedback from the measured displacement or distortion to correct the three-dimensional coordinates of node points other than the actually measured node points measured by optical and ultrasonic waves targeted for correction.¹

Thus, Shahidi fails to teach correction of node points other than the node points targeted for correction of the positions by any method. Shahidi also fails to teach the use of a finite element method for correction. The proposed combination of Shahidi with Grimsom fails to overcome the difference.

The claimed invention, by use of the finite element method, corrects the positions (the three-dimensional coordinates) of node points other than the node points targeted for correction of the positions thereof and can thereby achieve a three-dimensional brain model that more accurately represents the displacement or distortion of each of the parts other than the targeted parts by using the claimed finite element method.

Moreover, the claimed finite element method can act as an efficient function in that it “correct[s] the three-dimensional brain model to represent the current state of the brain (displacement or distortion of each of the parts thereof) with a high degree of precision” as disclosed in Paragraph 59. Accordingly, the present invention cannot properly be rendered obvious or otherwise be achieved, performed, or accomplished by Grimsom, Shahidi, or the combination of Grimsom and Shahidi.

¹ See Paragraph 59.

Independent claims 10 and 11 include substantially the same claim limitations as independent claim 1, and therefore these same claim limitations recited in independent claims 10 and 11 are not found in Grimson or Shahidi.

Applicants submit that a dependent claim incorporates each of the claim elements of the independent claim it properly depends from. Therefore, Applicants also respectfully request withdrawal of the §103 rejection and indicate the allowance of the dependent claims 2-6 and 8-9 by virtue of their respective dependencies from independent claim 1.

New claims 12 and 13 have been added. They are believed to distinguish from Grimson, Shahidi, for at least the same reasons as independent claims 1, 10, and 11. No new matter has been added.²

Because the independent claims are believed patentable, it is not necessary to discuss patentable limitations of claims depending therefrom, the references, or the rejections. The lack of a discussion of patentable limitations of those dependent claims should not be construed to mean that there are not patentable limitations in those dependent claims.

All reasons for patentability of the independent and dependent claims have not necessarily been discussed herein. No implication or construction should be made therefore.

Applicants have no further remarks with regard to any references cited by the Examiner and made of record, whether or not acted upon by the Examiner in the action's rejections, even if specifically identified in the action or any other paper or written or verbal communication. No implication or construction should be drawn about any review of the same by Applicants or Applicants' attorney.

Based on the foregoing, it is submitted that the Applicants' claims 1-6 and 8-13 are patentable over the references of record. Issuance of a Notice of Allowance is solicited.

Applicants' attorney welcomes the opportunity to discuss the case with the Examiner in the event that there are any questions or comments regarding the response or the application. This is intended to be a complete response to the Examiner's Office Action mailed on December 14, 2009.

We hereby authorize the United States Patent and Trademark Office to charge any additional fees, which may be required or credit any overpayment, to Deposit Account 50-1662.

² See at least Paragraphs 54 and 60 for support.

Respectfully submitted,

POLSINELLI SHUGHART PC

/Randy L. Canis/

Randy L. Canis, Reg. No. 44,584
100 South Fourth Street, Suite 1100
St. Louis, Missouri 63102
Tel: (314) 889-8000
Fax: (314) 231-1776
Attorney for Applicants